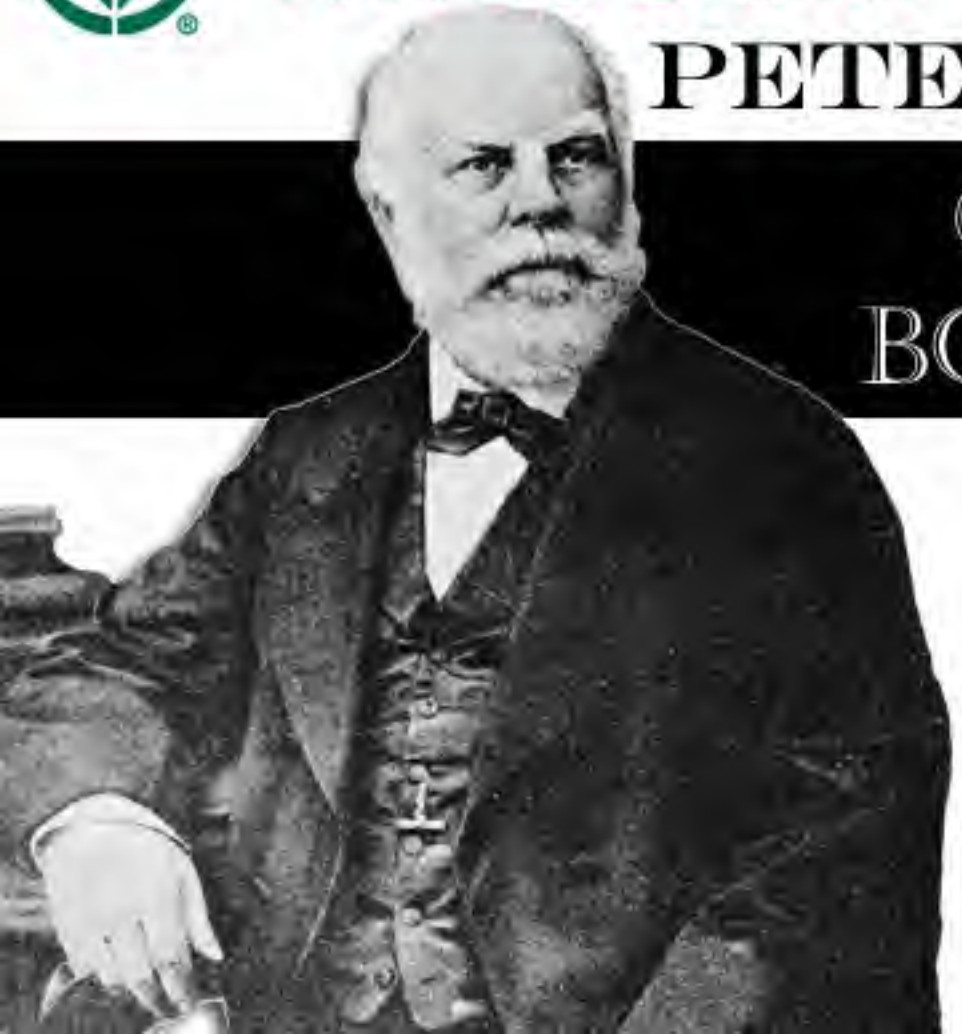
Missouri Botanical Garden
Peter H. Raven Library

George Engelmann Botanical Notebooks



Pagination Note:
Since many of the items lack a specific page number, the page number displayed online refers to the sequentially created number each item was given upon cataloging the materials.

GEOLOGY.

3800 **Bakewell Geology.** 590 pp., 8 large pl., some col., and many other ills. in text, 8, hf. cf., 1. 1.00

3801 **Bakewell Introduction to Geology.** 520 pp, ills. by maps, charts and col. sections, 8, bds., 3d ed., 2. .40

3802 **Barbee Physical and Moral Aspects of Geology.** 411 pp., many ills., 2, 1861. .35

3803 **Barnard Internal Structure of the Earth.** 16 pp, ills. 4to, p., new, 1877. .35

3804 **Barrande [J.] Papers.** 8, new, unb, or pap. unless otherwise specified, F, **Cephalopodes,** 270 pp, 4 double p, pl, 1877, 1.00. Same, 480 pp, 1870, 1.50. Same, 38 pp., 1868, 35c. Pteropodes Siluriens Boheme, 16 pp., 1867, 25c. Colonie d' Archiac, 186 pp., finely col. geological maps, 1870, 60c. Defense des Colonies, Part III., etude Generale sur nos Etages, G–H, 367 pp., 2 extra large pl. of col. sections, 1865, 1.00. Cephalopodes Siluriens Boheme, 48 pp., 1867, 25c. Arethusina Faune Silurienne de Hof., 110 pp., 2 pl. many figs., 8, 1868, 75c. Primordial Fauna and Taconic System, Notes by Marcou, 14 pp, 1860, 25c. Cephalopodes Paleozoique, 28 pp., extra large pl., 25 figs., 1860, 30c. Depots Siluriens de Boheme. et de Scandinavie, 67 pp., 4to, 1856, 50c. Orthoceres 28 pp, extra large pl., many figs., 1859, 25c. Trilobites, 282 pp., 1871, 1.50. Faune Primordiale et le Systeme Taconique en Amerique, 118 pp., 2 extra large pl, many figs. of Trilobites, 1, 1861. .75

3805 **Belt, Stone Implements, the Glacial Periods,** &c., 52 pp., 8, p., new, 1877 and 1878. .40

3806 **Beudant Geologie.** 348 pp., 392 ills., F, hf. Turkey, 1. .75

3807 **Brougham Instinct and Fossil Osteology.** 203 pp, 3. .35

3808 **Buch. Petrifications Recueillies en Amerique par M. Humboldt et C. Degenhardt.** 22 pp, 2 pl, large folio, F, 1, except staining by age. 1.50

3809 **Bulletin de la Societe Geologique.** 732 pp., 11 pl., some col. maps others ills., 8 parts, 1868 to 1878, 8, p, new, lot. 1.50

3810 **Burr Practical Geology.** 288 pp., maps, pl. and figs., 1. .35

3811 **Cleve. West India Islands.** 48 pp., 2 maps, many figs., 4to, p., new, 18[illegible]

3830 **Prof. Wm. F. Gabb's Papers.** 4to, unbound, or paper, new, unless otherwise specified. New Cretaceous Fossils, 10 pp., 36 figs., 1860, 35c. New Species of Am. Tertiary and Cretaceous Fossils, 29 pp., 3 pl., 153 figs., 2, 1860, 75c. Same, without text, 3, 30c. Peru Fossils in the Raimondi Collection, 74 pp., 9 pl., over 100 figs., 1877, 1.25. Horn Secondary and Tertiary Polyzoa, 69 pp., 3 pl., 1, 1862, 75c. Following are, 8, pap. or unb., new, Cretaceous Fossils from S. A., 17 figs, 1860, 10c. Two [2] New Texas Carboniferous Fossils, pl., 1859, 10c. N. J. Cretaceous Fossils, 17 figs, 1860, 10c. Catalogue of Cretaceous Invertebrate Fossils, 20 pp., with notes, 3, 1859, 25c. Fossils from the Upper Amazon, 15 figs., 1868, 10c. Check-List of Carboniferous Jurassic, Triassic and Cretaceous Fossils of Cal., 20c. Polorthus, 8 figs., 20c. Fossils from the Pacific Coast, 32 pp., 1869, 10c. Revision of the Species Baculites, with pl., 1861, 10c. Geology of Santo Domingo, 1871, 10c. Mexican Cretaceous Fossils, 3 pl., 1872. .30

3831 **Geinitz Sachsisch-Bohmischen Petrifications, &c.** 141 pp., 25 pl., hf. mor., 4to, 1. 2.00

3833 **Geological Magazine Monthly.** 8, p., new, Vols. II., III., IV., and 1st 4 Nos. of V., 2013 pp., 60 pl., many hund. figs., and very many figs. in text; very many original articles by leading geologists; per vol., 2.50, or lot, 1875 to 1878. 7.50

3834 **Giebel Versteinerungen im. Muschelkalk von Lieskau, bei Halle.** 80 pp, 7 pl, 4to, G, 2, 1856. 1.25

3835 **Gilpin Organic Remains the Result of an Ancient Tropical Region.** 40 pp., 8, p., 2, rare. .30

3837 **Guppy Miocene Fossils of Haiti.** 18 pp., 2 pl., 21 figs., 8, p., new, 1876. .20

3838 **Guppy W. I. Tertiary Fossils.** 23 pp., 3 pl, many figs., 8, p., 1, 1874. .20

3839 **Hagenow Bryozoen der Maastrichter Kreidebildung.** 123 pp., 12 pl., several hundred figs., 4to, hf. mor., G, 1. 2.00

3840 **Prof. James Hall's Papers.** 8, unbound or paper, new, unless otherwise specified. Brachiopoda, 25 fig., 7 pp, 1872, 25c. New Fossils, 21 pp., 1861, 20c. New Fossils from Ind. and Ill., 36 pp., 1856, 30c. New Genera of Ambonychia, &c., 17 pp., 21 ills., 1858, 35c. New Graptolithus, Goniatites and other new species, 75 pp., over 100 ills. 1860.

MISSOURI BOTANICAL GARDEN
copyright reserved

13599

MISSOURI BOTANICAL GARDEN
GEORGE ENGELMANN PAPERS

FOR SALE BY A. E. FOOTE, 1223 BELMONT AVE., PHILAD'A.

Smithsonian Reports.

This invaluable series contains not only many original articles, but translations from the most important European, scientific writings.

8vo. new, or good as new. Full set $15, or without '73, '74, '75 and '76, $12.

4975 **1853.** 8th Report. 269 pp., including all the Annual Reports up to date. Giving Smithson's Will, and very much other interesting matter in regard to the organization of the Institution. .50

4976 **1854.** 463 pp. S. F. Baird on American Explorations. Marsh, The Camel; other articles by Jackson Foster and Whitney, &c., &c. .35

4977 **1855.** 438 pp., 79 ills. Müller's Progress in Physics, 112 pp., and other articles on Meteorology, Ethnology, &c. Oxygen, and its combinations, Prof. Chace of Brown University. Algæ, by Harvey, 44 pp,, &c. .75

4978 **1856.** 467 pp., ill. Prof. Jos. Henry, Physics, Acoustics and Building Materials, 56 pp. Baird, Directions for collecting, preserving and transporting specimens in Nat. Hist., 18 pp. Gill, Fishes of N. Y., 16 pp. Müller, Electricity, 100 pp, ill. Guest, Indian Remains, &c. 1.00

4979 **1857.** 438 pp., ills. Jos. LeConte, Coal, 50 pp., ill. Müller, Physics, 98 pp., and other articles. .75

4980 **1858.** 448 pp., ill. Dr. J. L. LeConte, Insects. Birds of Bermuda. Forest and Trees of Am. Atmospheric Electricity, Duprez. Instructions for collecting nests and eggs of N. A. Birds, Insects, Coleoptera, &c. Memoir of Priestley by Cuvier, &c., &c. .75

4981 **1859.** 450 pp., ills. Prof. S. W. Johnson, Agric'l Chem., 76 pp., many ill. P. P. Carpenter, Shells, 25 pp., ills. R. Mallet, Earthquakes, 25 pp., ills. Ethnology, Meteorology, &c., &c. 1.50

[illegible] ills. Memoir of Haüy by Baron

Pacific Railroad Surveys.

13 Vols., 4to. Cost the Government over $200, nearly new, cloth, $25, good condition $20, fair condition $18, half calf, good condition $25, fair condition $20, calf, good condition, $30. To the working Naturalist these volumes are indispensable. The Zoologist cannot afford to do without Vols. 8, 9, 10 and 12, Part 2. Every Geologist and Mineralogist needs Vols. 2, 3, 5, 6, 7 and 11. Every Ethnologist ought to have Vols. 1, 3, 4, 11 and 12. Every Engineer wants Vols. 1, 2, 3, 4, 5, 6, 7, 11 and 12, Part 1. They contain many monographs, and thousands of plates and illustrations that cannot be found elsewhere. The prices given after each volume are for cloth copies in fair second-hand condition. Defective, badly stained or torn copies at much lower rates. Calf or half calf 20 per cent. higher.

5101 **Vol. 1.** 793 pp. Gov. I. I. Stevens on the Climate, Ethnology, Natural History of the region near the 49th Parallel, &c., &c. 1.00

5102 **Vol. 2.** 590 pp., 2 maps, 37 pl., 13 col., and other ills. Beckwith's Report, 223 pp., 13 col. pl. Geology by Schiel, 19 pp., 4 pl., &c. Botany by Torrey and Gray, 18 pp., 10 pl. Lander, Reconnaissance, 45 pp. Pope's Expedition, 156 pp. Botany by Torrey and Gray, 29 pp., 10 pl., many figs. Geology by W. P. Blake, 40 pp., 2 large col. maps, &c., &c. 1.25

5103 **Vol. 3.** 575 pp., 3 large col. maps and sections, 8 charts, 23 pl., 21 col., and many other ills. Whipple and Ives Report, 220 pp., 12 col. pl., 8 charts and other ills. Turner, Ewbank and Whipple, Indian Tribes, 127 pp., 8 col. pl. and over 100 other ills. Marcou, Hall and Blake, Geology and Mineralogy, 185 pp., 3 large col. maps and sections, 3 pl., 1 col., and 27 other ills, &c., &c. 1.50

5104 **Vol. 4.** 505 pp., large chart, 59 pl. and other ills,

0 cm 1 2 3 4 5 6 7 8 9 10
copyright reserved
MISSOURI BOTANICAL GARDEN

" Border Carnation "

Mark 8 1820

"Bethlehem" (in Schweinitz's handwriting)
= 46. Mond. Rhiz

37 - 41 s
60

0.62 - 0.69 mm Longit. diam

16 Cem. 5 - 6 mehrzellig

no oder verzweigte Zellen
in Sporangien

13600

H. W. BARKHOEFER & CO.,

DRUGGISTS & PHARMACISTS,

No. 2934 Olive Street, S. E. Corner Garrison Avenue,

ST. LOUIS, MO.

℞

MISSOURI BOTANICAL GARDEN
GEORGE ENGELMANN PAPERS

cm 0 1 2 3 4 5 6 7 8 9 10
copyright reserved
MISSOURI BOTANICAL GARDEN

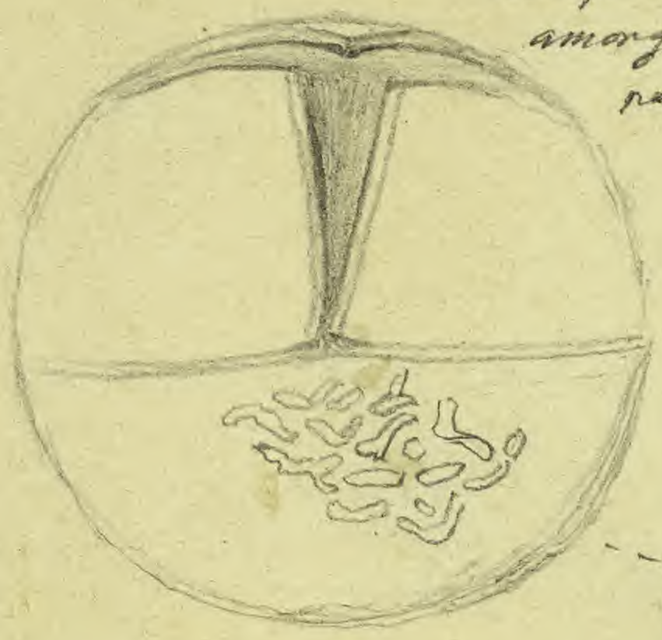
Isoetes lacustris ?

Grand Lake, Middle Park, Colorado, 8000 feet alt

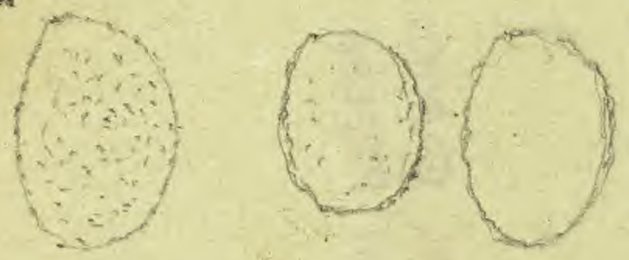
Octob 8' 1881

×60

old spore, found among the roots partially open



×415



4 fresh spores $\frac{38-39.5}{60}$ = 0,63 – 0.66

$\frac{11-15}{415}$

0.026–0.036 mm

mostly about 0.032

others are $\frac{36}{60}$ = 60

×150

part of lower hemisphere

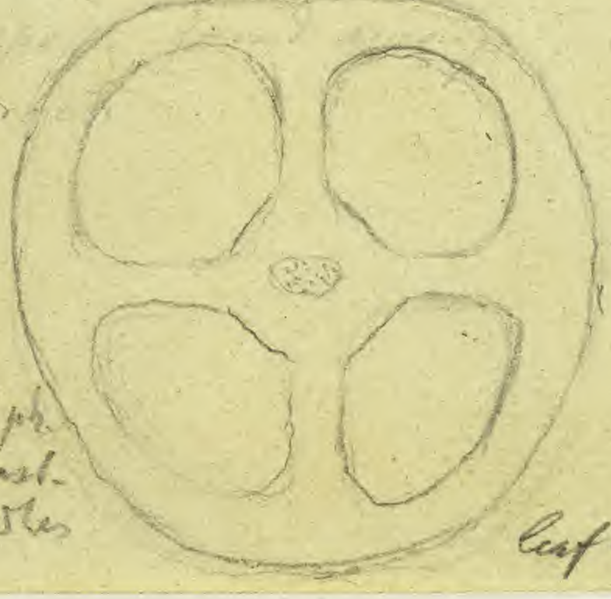
part of one of the upper triangles

ligula ×10

spores $\frac{40}{60}$ = 0.67 mm in longest diam

×30

Section of leaf



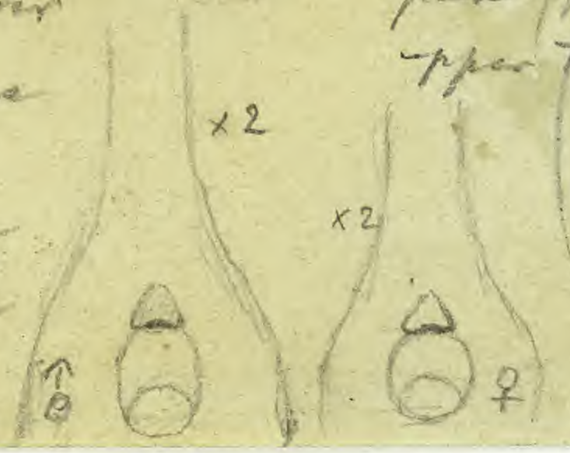
no peripheral cavities

no stomata seen

leaf almost terete

×2

×2



0 1 2 3 4 5 6 7 8 9 10
cm
copyright reserved
MISSOURI BOTANICAL GARDEN

13601

Leitch & Corlies

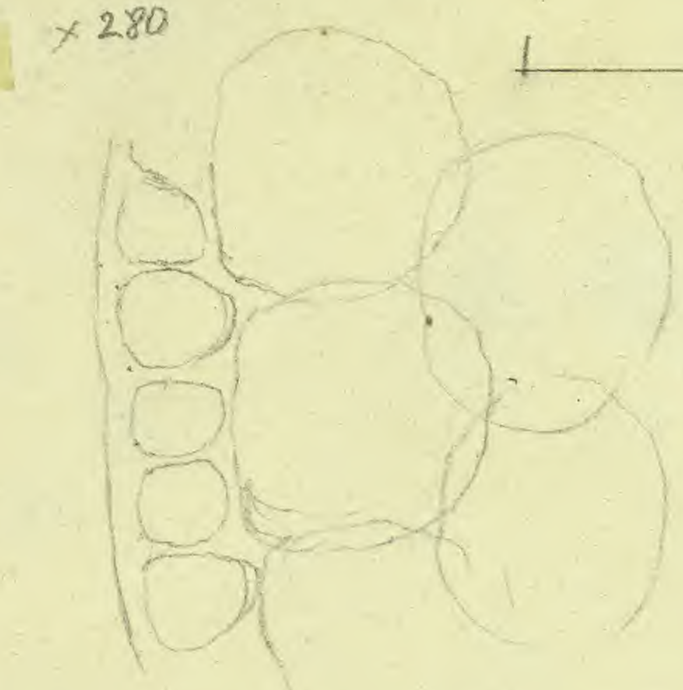
DRUGGISTS

South West Corner Fifth and Market Streets

MISSOURI BOTANICAL GARDEN
GEORGE ENGELMANN PAPERS

0 cm 1 2 3 4 5 6 7 8 9 10
copyright reserved
MISSOURI BOTANICAL GARDEN

Isoetes howellii var paupercula Jan 1st 1882
Castle Lake North Calif, Bigelo
1881

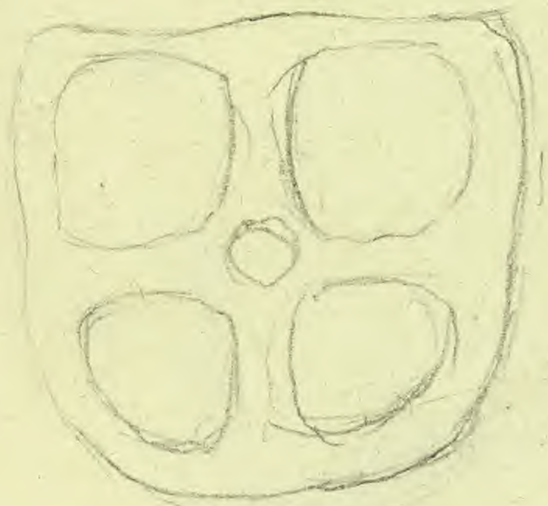


epidermis × 280

$\frac{32-38.5}{60} = 0.53-0.64$

no stomata
no peripheral bast bundles
very thick walls of leaf
dark green

× 20
sect of leaf



0 1 2 3 4 5 6 7 8 9 10
cm
copyright reserved
MISSOURI BOTANICAL GARDEN

13602

ALEX. LEITCH,

APOTHECARY & PHARMACEUTIST,

Marble Building Cor. Fourth & Olive Sts. St Louis, Mo.

MISSOURI BOTANICAL GARDEN
GEORGE ENGELMANN PAPERS

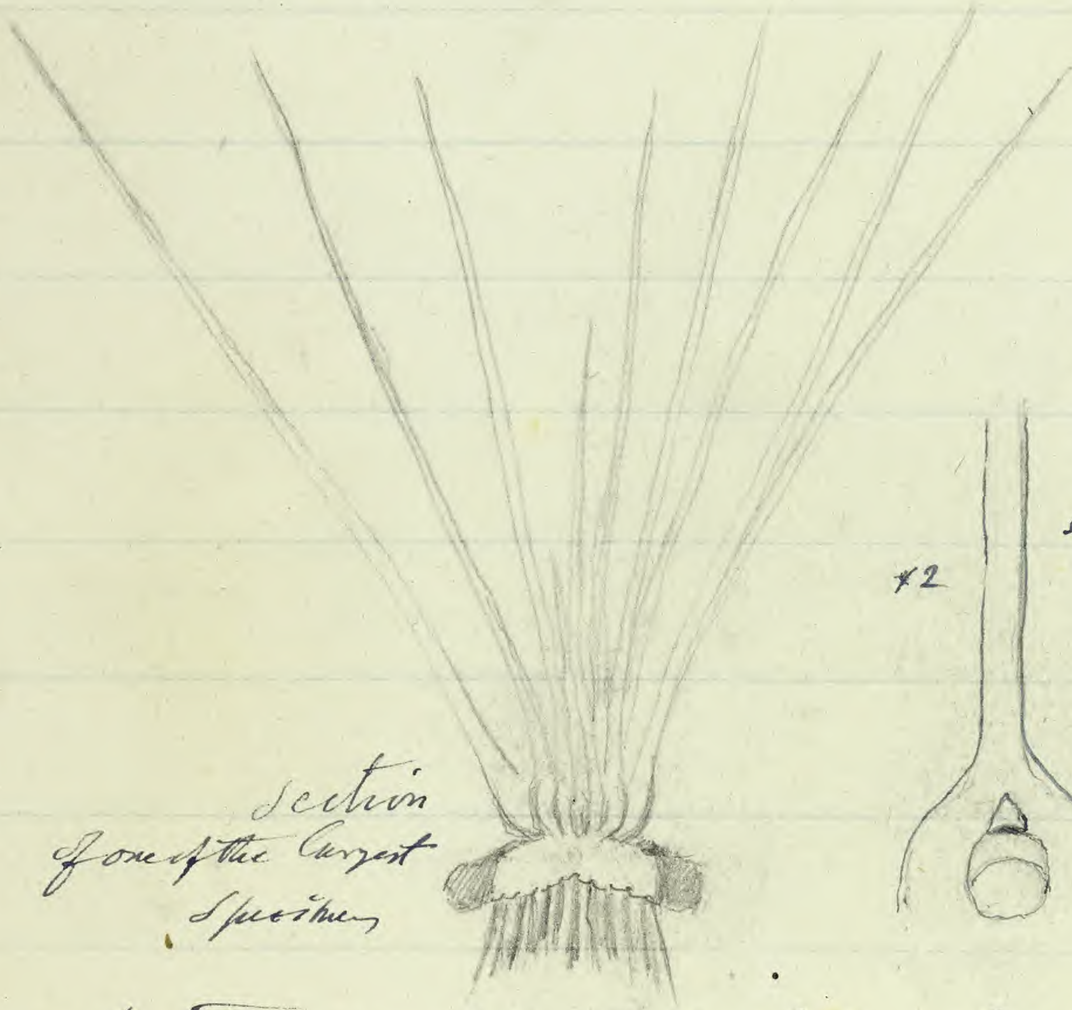
cm 0 1 2 3 4 5 6 7 8 9 10
Copyright reserved
MISSOURI BOTANICAL GARDEN

Aug 5 1881

Isoetes lacustris var *paupercula*

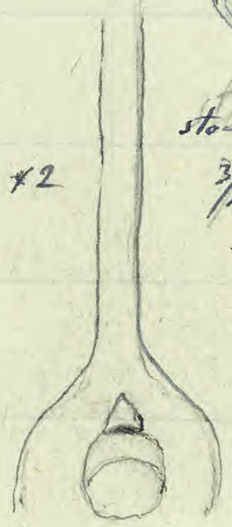
not yet mature; gravelly granitic soil in Grand Lake, Middle Park, Colorado

between the depths of 2 and 4 or at most 4½ feet, almost covering the sandy or rather gravelly soil at the south west end of the lake, most abundant at the depth of 3 feet, not at a lesser depth than 2 feet, 8 or 10 yards from shore



Section of one of the largest Specimens

×2



Stoutest leaves 3/4 line in diam.

×10

Trunk flat, with the decayed ends mostly protruding downward

roots very long, 3–4 inches, simple or mostly once or twice bifurcated (once a trifurcated root seen)

leaves 2–3 inches long, 10–18 in number those of the stoutest plants 3/4 line in diameter; all rigid, even out of water retaining their divergent position

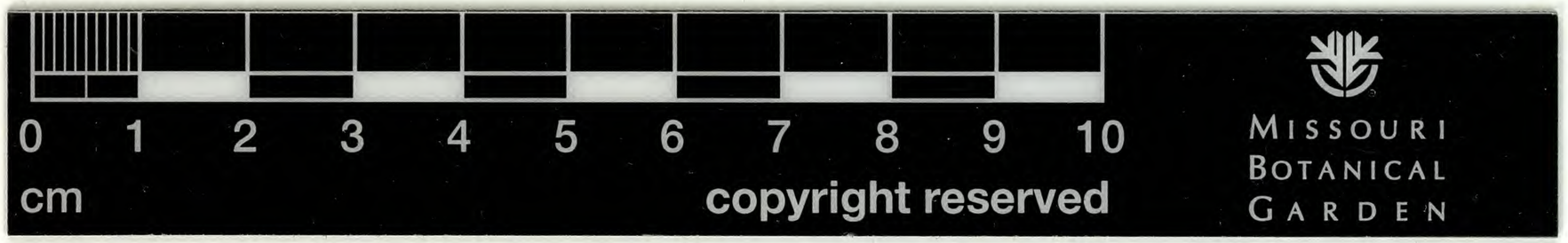
the thin part of leaf short and round, wings running up the leaf only slightly

Sporangium circular, small, upper third part covered by velum; ligula broad triangular. Spores in mature yet, as far as possible to see, the faces of spores perfectly smooth.

0 1 2 3 4 5 6 7 8 9 10
cm
copyright reserved
MISSOURI BOTANICAL GARDEN

13603

MISSOURI BOTANICAL GARDEN
GEORGE ENGELMANN PAPERS



IV. *Direction of Winds and number of Thunderstorms in* '61 & '62.

1861.	E.	N.	N.E.	S.W.	N.W.	S.	W.	S.E.	Prevailing Winds.	Thunder-storms.
January.....	11	3	12	22	38	18	28	61	S.E.	 0
February	4	2	2	35	24	19	41	60	S.E.	 2
March.....	12	11	10	23	30	19	42	40	W. & S.E. ...	 3
April	16	10	9	26	21	35	34	26	S. & W.	 2
May	26	10	23	21	8	13	49	35	W. & S.E. ...	 5
June	12	21	22	20	25	26	8	41	S.E.	 7
July	3	31	14	21	26	46	15	29	S.	 3
August	18	24	58	17	11	18	3	37	N.E.	 5
September...	6	14	18	26	30	13	21	52	S.E. & N.W.	 3
October	12	9	5	21	30	33	30	46	S.E. & S.....	 1
November....	7	15	8	22	27	20	36	44	S.E. & W....	 1
December ...	9	19	9	25	23	33	17	51	S.E. & S.....	 0
	136	169	190	279	293	293	324	522	S.E.	 32

1862.	E.	S.W.	N.	N.E.	W.	S.	N.W.	S.E.	Prevailing Winds.	Th. st's.
Jan.	19	6	19	23	29	3	38	51	S.E.	1
Feb.	14	9	18	16	22	7	39	43	S.E. & N.W.	0
March ...	9	14	3	15	59	10	34	43	W., S.E. & N.W. ...	4
April	12	13	18	31	18	11	34	47	S.E., N.W. & N.E..	6
May	12	18	14	38	18	30	14	44	S.E. & N.E.	5

13604

Additional Remarks on Atmospheric Electricity.

By A. Wislizenus, M.D.

The delay in the publication of this volume enables me to add to my observations of atmospheric electricity in 1861, the result of my observations in 1862. The latter observations have been made in the same manner and by means of the same fine glass thread, which, after many thousand torsions, proves as good as ever. I present herewith in tabular form the general result of my observations in 1861 and 1862.

I. *Monthly mean of Positive Atmospheric Electricity in* 1861 *and* 1862, *at St. Louis, Mo., based upon daily observations at* 6, 9, 12, 3, 6 *and* 9 *o'clock, from morning till night.*

	Jan.	Feb.	Mar.	Ap'l.	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Mean of Year.
1861*.	16.5	12.1	9.8	8.8	7.8	4.0	3.7	3.4	3.0	7.1	10.0	14.3	8.4
1862...	12.1	16.0	9.4	10.6	7.5	3.0	2.2	2.3	3.0	7.7	12.6	13.9	8.4

* This table of 1861 differs in some decimals from that published on page 66 and in Diagram No. 1. Having discovered some errors, I calculated all my observations once more, and give now the present as the corrected table.

II. *Monthly mean of Temperature and of Relative Humidity in* 1861 *and* 1862, *at St. Louis, Mo., based upon daily observations, cotemporaneous with those of Atmospheric Electricity.*

TEMPERATURE.

	Jan.	Feb.	Mar.	Ap'l.	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Mean of Year.
1861...	32.2	40.4	44.8	58.1	64.1	76.9	77.5	78.6	69.1	57.9	46.0	39.7	57.1°F.
1862...	28.9	30.2	43.2	55.0	69.7	75.1	81.2	80.7	72.1	57.3	42.6	41.3	56.4°F.

RELATIVE HUMIDITY.

	Jan.	Feb.	Mar.	Ap'l.	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Mean of Year.
1861...	72.2	63.3	64.5	61.5	66.3	70.8	66.3	69.6	77.3	76.6	69.0	74.3	69.5
1862...	85.3	73.9	70.8	67.0	57.3	67.0	66.8	64.3	74.2	67.2	69.5	74.6	69.8

III. *Yearly mean of Positive Electricity of Temperature, and of Relative Humidity of the Atmosphere, at the hours of* 6, 9, 12, 3, 6 *and* 9, *from morning till night, based upon daily observations at these hours through the years* 1861 *and* 1862, *at St. Louis, Mo.*

ELECTRICITY.

	At 6 A.M.	At 9 A.M.	At 12 M.	At 3 P.M.	At 6 P.M.	At 9 P.M.
1861	8.6	10.0	9.2	7.9	8.7	6.9
1862	8.9	10.0	9.1	7.3	8.1	6.8

TEMPERATURE.

1861	48.9° F...	54.9	61.6	63.6	59.3	54.3
1862	48.9	55.0	60.9	62.3	58.0	53.6

RELATIVE HUMIDITY.

1861	86.4	71.3	60.3	57.2	65.1	77.3
1862	85.3	70.6	60.0	57.5	67.6	78.0

Missouri Botanical Garden
George Engelmann Papers

0 1 2 3 4 5 6 7 8 9 10
cm
copyright reserved
Missouri Botanical Garden

Oct.....	1	15	19	4	10	40	47	46	N.W. & S.E.	1
Nov.....	14	19	21	12	43	19	34	18	W. & N.W.	0
Dec.....	11	17	21	5	34	45	13	38	S., S.E. & W.	4
	112	191	211	230	259	265	351	550	S.E.	50

V. *Positive or Negative Electricity in the Observations of* '61 & '62.

	Positive Electricity.		Negative Electricity.		No Electricity, or 0.		Highest Positive Electricity.	
	1861.	1862.	1861.	1862.	1861.	1862.	1861.	1862.
Jan.....	179	179	3	5		2	40°	40°
Feb.....	162	166	6	2			34	33
March ...	168	179	15	8			30	48
April	157	157	12	22	1	1	33	52
May.....	171	180	17	5	1	3	25	32
June	162	143	5	2	8	20	16	21
July.....	183	153	3	8	1	24	14	11
August..	176	143	5	4	6	40	15	19
Sept.....	169	117	1	1	10	61	18	23
Oct.....	162	143	4	3	20	41	33	35
Nov.....	172	157	2	7	6	16	42	42
Dec.....	175	166	5	0	6	17	37	35
	2046	1883	78	67	59	225	42°	52°

Memoirs
5080 0.34 - 0.44
5091 0.33 — 0.44
5093 0.35 — 0.41
6025 — 0.28 - 0.47 max

Minimum
5080 0.027 - 0.030
5091 0.026 - 0.031
5093 0.027 - 0.031
6025 — 0.024 — 0.029 min

0 1 2 3 4 5 6 7 8 9 10 cm
copyright reserved
MISSOURI BOTANICAL GARDEN

Vc 5091

Scotts Cal. formin

Jan 6 1867

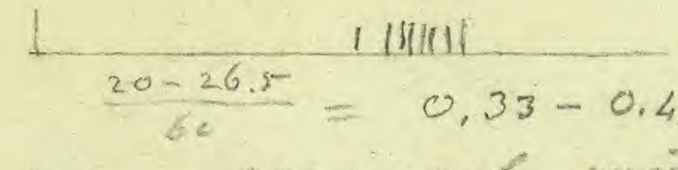
little pools in large meadow on upper Tuolumne River, H. Bolander 1866

9700 feet high

12–25 leaves

6–7 cm long

0.026
–0.031



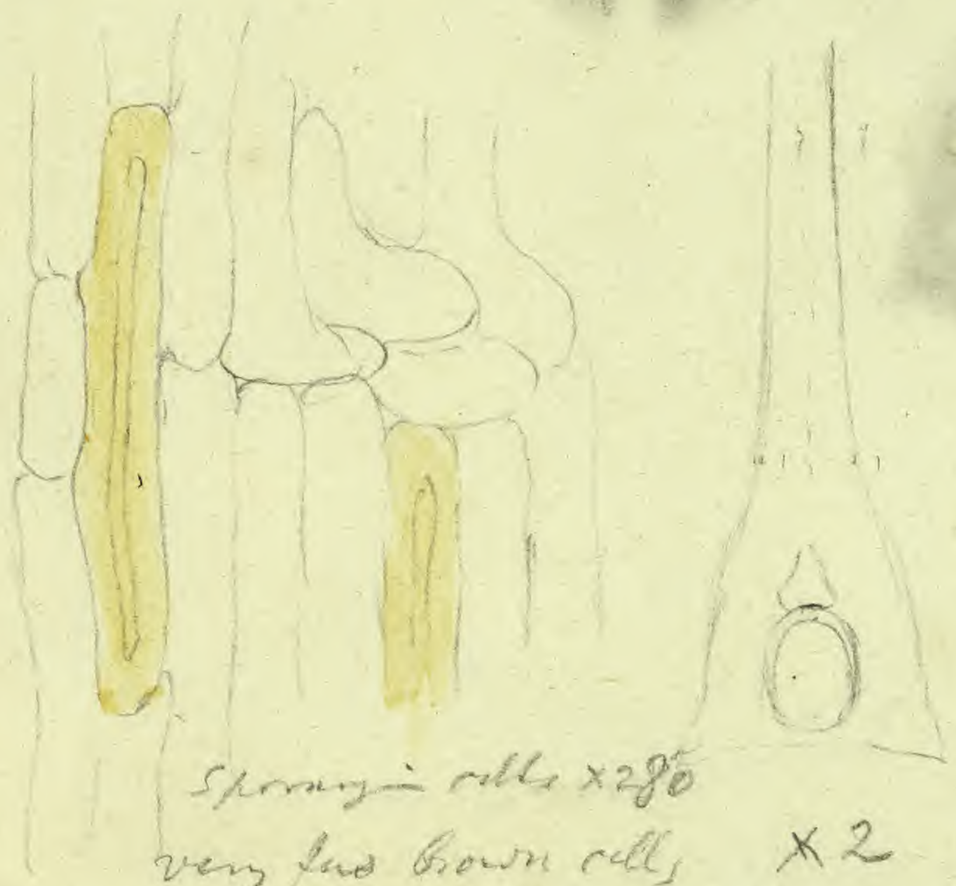
$\frac{20-26.5}{60} = 0,33-0.44$ mm

marginal nearly smooth angles very prominent

apex almost smooth

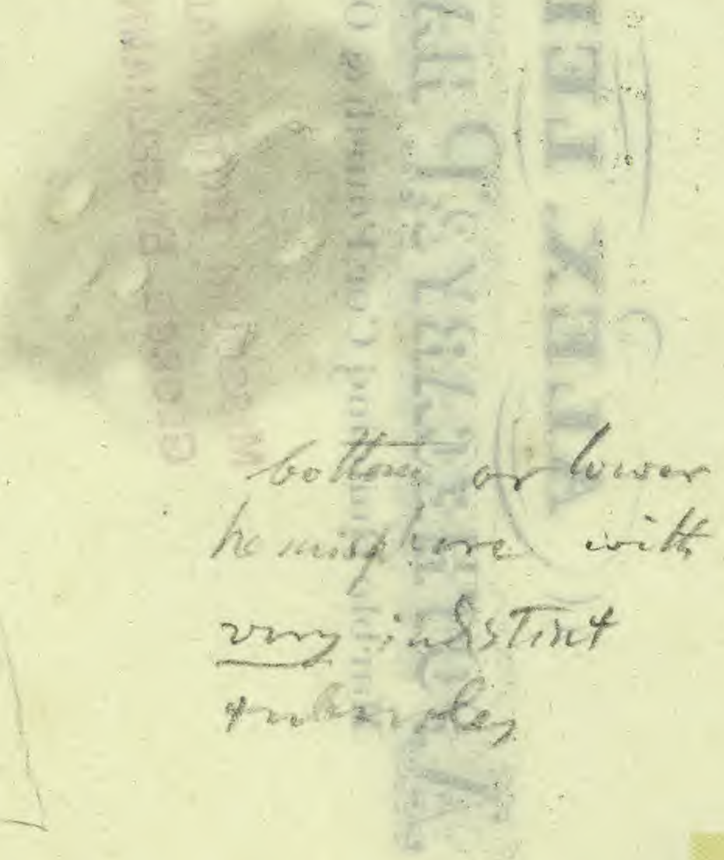
×150

almost smooth



Spongy cells ×285

very fine brown cells ×2



bottom or lower hemisphere with very distant tubercles

0 1 2 3 4 5 6 7 8 9 10
cm
copyright reserved
MISSOURI BOTANICAL GARDEN

13605

ALEX. LEITCH,

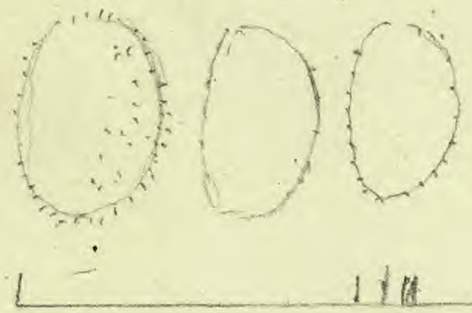
APOTHECARY & PHARMACEUTIST,

Marble Building Cor. Fourth & Olive Sts. St. Louis, Mo.

MISSOURI BOTANICAL GARDEN
GEORGE ENGELMANN PAPERS

cm 0 1 2 3 4 5 6 7 8 9 10
copyright reserved
MISSOURI BOTANICAL GARDEN

No 5093 Southern California
near Mono Trail, 10000 feet high,
Dec. 6 1867
H. Bolander
1866



0.027
– 0.031 mm

1 lin

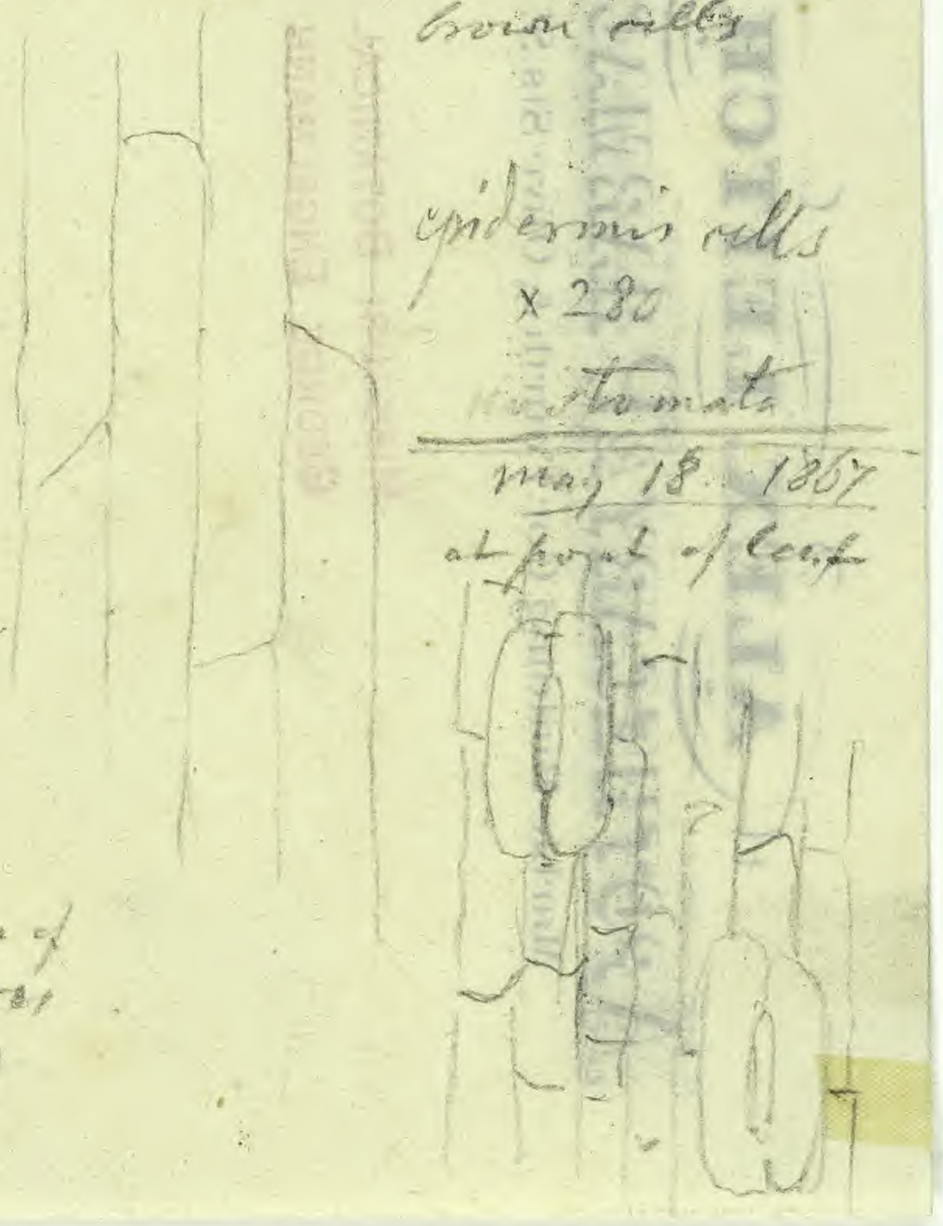
$\frac{21-24.5}{60}$ = 0,35 – 0.41 mm

Epidermis cells
X 280
Stomata

X 2

Stomata, Tubercles,
very slight, or none

Surface of
Spores
X 150



May 18. 1867
at foot of Cerro

0 1 2 3 4 5 6 7 8 9 10
cm
copyright reserved
MISSOURI BOTANICAL GARDEN

13606

ALEX. LEITCH,

APOTHECARY & PHARMACEUTIST,

Marble Building Cor. Fourth & Olive Sts. St Louis, Mo.

MISSOURI BOTANICAL GARDEN
GEORGE ENGELMANN PAPERS

0 cm 1 2 3 4 5 6 7 8 9 10
copyright reserved
MISSOURI BOTANICAL GARDEN

S. California

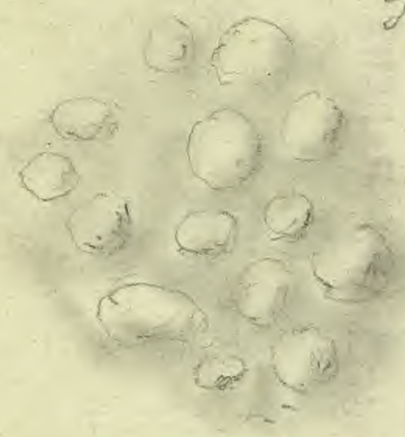
May 12 1867

No 5080 Mt Diablo Area

surface of spore

X 150

Surface of another spore



0 1 2 3 4 5 6 7 8 9 10
cm
copyright reserved
MISSOURI BOTANICAL GARDEN

13507

Alex. Leitch,

APOTHECARY & CHEMIST,

Cor 4th & Olive Sts. St. Louis.

MISSOURI BOTANICAL GARDEN
GEORGE ENGELMANN PAPERS

0 cm 1 2 3 4 5 6 7 8 9 10
copyright reserved
MISSOURI BOTANICAL GARDEN

S. California April 17 1867

No 5091 Bolander 1866

Tuolumne Co.

×280

Stomata rare and small and somewhat cramped — after a long and oft repeated search I only succeeded in discovering many in a piece of leaf, in others nothing

May 18. I examined other leaves of the same specimens and found only in one fragment stomata.

0 1 2 3 4 5 6 7 8 9 10
cm
copyright reserved
MISSOURI BOTANICAL GARDEN

13608

Alex. Leitch,

APOTHECARY & CHEMIST,

Cor 4th & Olive Sts. St. Louis.

MISSOURI BOTANICAL GARDEN
GEORGE ENGELMANN PAPERS

0 cm 1 2 3 4 5 6 7 8 9 10
copyright reserved
MISSOURI BOTANICAL GARDEN

N 5080 Western California Jan 6 1867

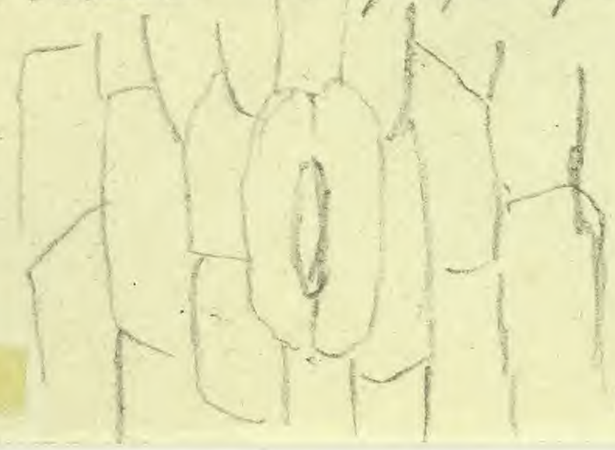
mount Dana, 10,000 feet high, H. Bolander

0.027
-0,030 mm

fully ripe, greyish brown
smooth.

$$\frac{\text{diam of macrospores} \times 60}{22{,}8 - 26{,}2} = 0{,}38 - 0{,}44$$

macrospore exactly like those of 6025, sometimes with a little more distinct and blunt tubercles, sometimes perfectly smooth.

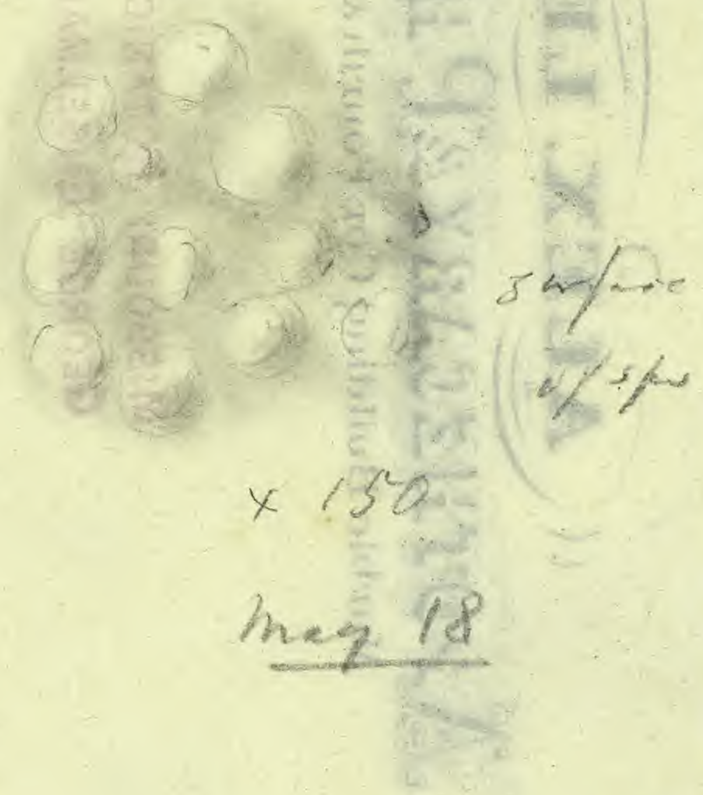


×280

macrosporang
×2

microsporang
×2

10–15 leaves
9–11 c.m long



spongy pale
no brown cells

surface of spore

×150

May 18

0 1 2 3 4 5 6 7 8 9 10
cm
copyright reserved
MISSOURI BOTANICAL GARDEN

13609

ALEX. LEITCH,

APOTHECARY & PHARMACEUTIST,

Marble Building Cor. Fourth & Clive Sts. St. Louis, Mo.

MISSOURI BOTANICAL GARDEN
GEORGE ENGELMANN PAPERS

cm 0 1 2 3 4 5 6 7 8 9 10
copyright reserved
MISSOURI BOTANICAL GARDEN

Jan 9 1880

Boreles

Mr Jones, subalpine Lake at Alta,
Wasatch Mountains Utah
Aug 12 1879

immature $\frac{19}{60} = 0.32$

stomata !

no peripheric Basal bundles

veins partly covers sporangi—

nearer spore immature

$\frac{17-25^{\text{m}}}{60}$ mm 20

= 0.28 – 0.41, mm 0,33

mature, found among the roots

0 1 2 3 4 5 6 7 8 9 10
cm
copyright reserved
MISSOURI BOTANICAL GARDEN

13610

Henry T. Rohlfing,

APOTHECARY,

No. 2600 Laclede Ave., S. W. Cor. Jefferson Ave.

ST. LOUIS, MO.

℞

MISSOURI BOTANICAL GARDEN
GEORGE ENGELMANN PAPERS

cm 0 1 2 3 4 5 6 7 8 9 10
copyright reserved
MISSOURI BOTANICAL GARDEN

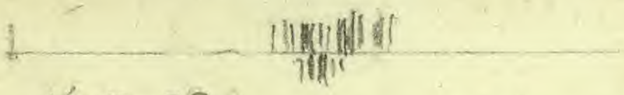
Oct 20 1873
Nov 11 "

Coulter

Falls of Yellowstone Aug. 1873 Coulter & Carey

×60

smooth surfaces
or with very minute tubercules
& shallow



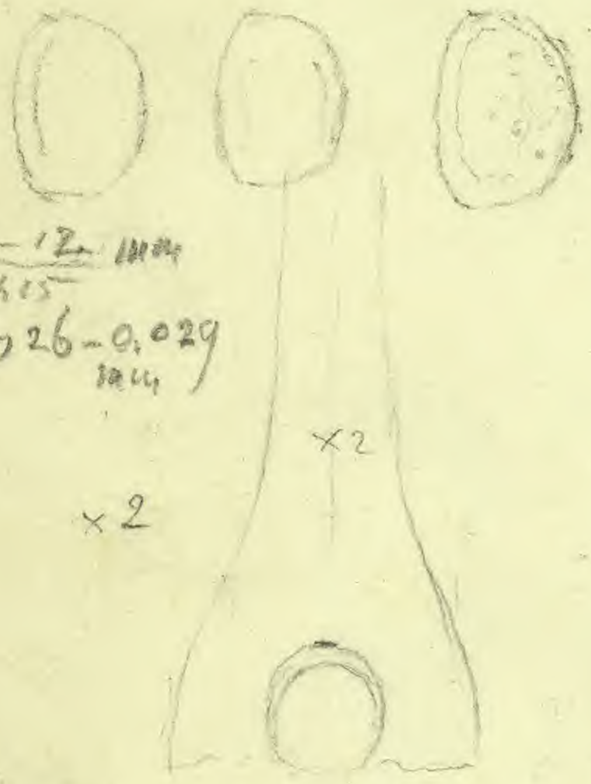
16.5–23/60 0.28–0.38 mm
19–20/60 mostly 0.32–0.33 mm

surface ×150

×280

Stomata

no cuticular flat cells



11–12 mm
405
=0.026–0.029 mm

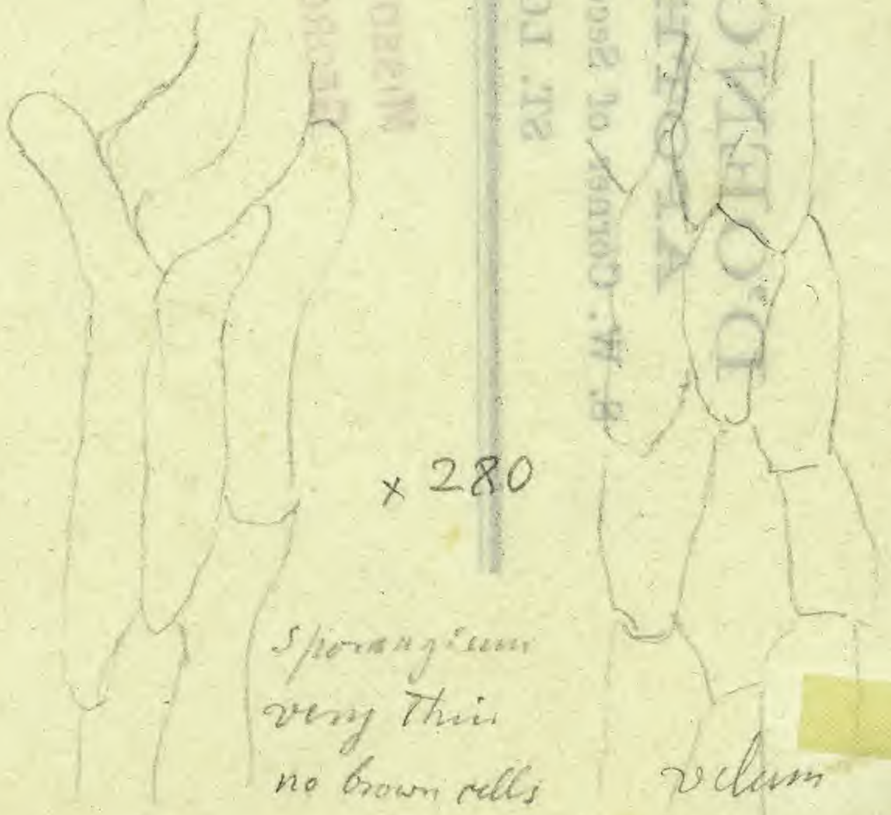
×2

×2

velum narrow

sect. of leaf ×10

surface with ridges
or faint tubercles
or almost smooth



×280

Sporangium
very thin
no brown cells

velum

0 1 2 3 4 5 6 7 8 9 10
cm
copyright reserved
MISSOURI BOTANICAL GARDEN

13611

D'OENCH & CO.,

APOTHECARY,

S. W. Corner of Second & Mulberry Streets,

ST. LOUIS, MO.

MISSOURI BOTANICAL GARDEN
GEORGE ENGELMANN PAPERS

cm 0 1 2 3 4 5 6 7 8 9 10
Copyright reserved
MISSOURI BOTANICAL GARDEN

Scales.

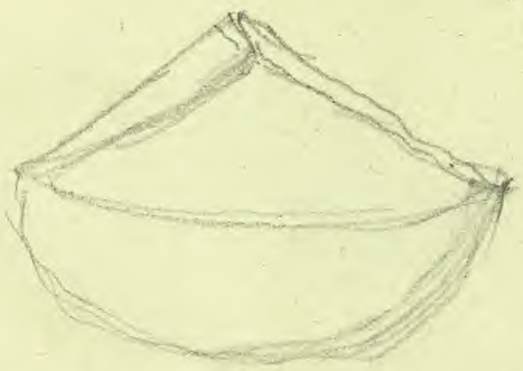
Oct 6 9 1881

Grand Lake, on N. Fork, Colorado 8000 ft alt

$\frac{30-32}{60} = 0.50-0.53$ mm.

are these young and not fully grown spores?

×60



×150

0 1 2 3 4 5 6 7 8 9 10
cm
copyright reserved
MISSOURI BOTANICAL GARDEN

13612

ALEX. LEITCH,

APOTHECARY & PHARMACEUTIST,

Marble Building Cor. Fourth & Olive Sts. St. Louis, Mo.

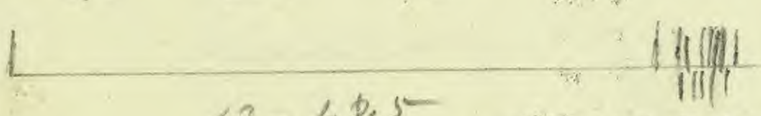
MISSOURI BOTANICAL GARDEN
GEORGE ENGELMANN PAPERS

0 cm 1 2 3 4 5 6 7 8 9 10
copyright reserved
MISSOURI BOTANICAL GARDEN

x415

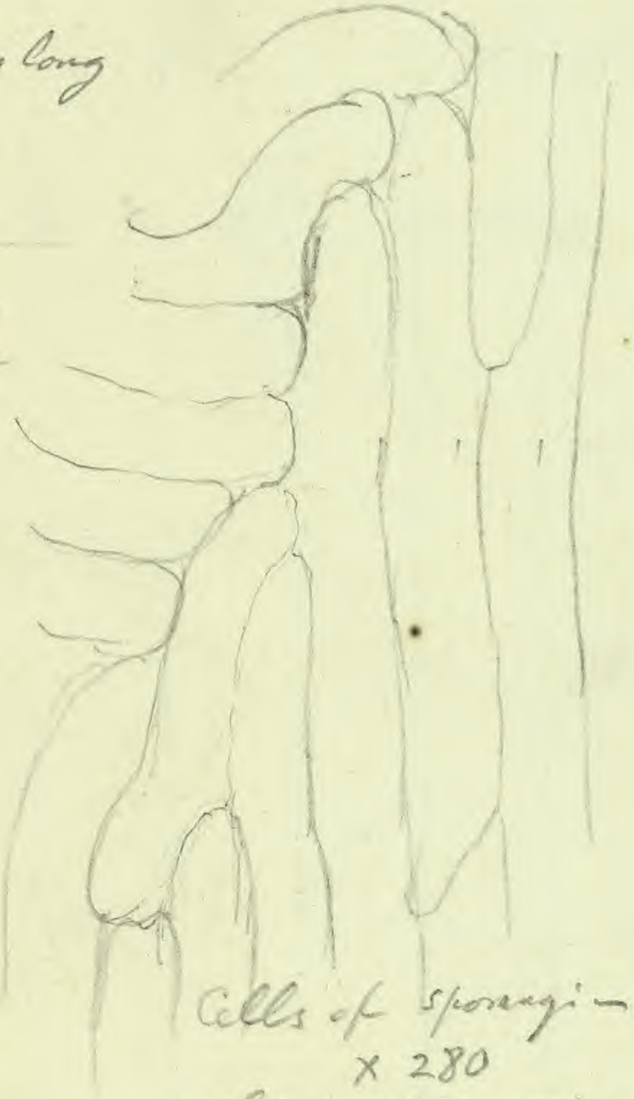
Isoetes macrospora Dur. !! over Orl 20 1866
Catskill Mts in Herb Acad Phila
abt 20 leaves, long
4-4½ inches

0.034
-0.036 mm long
smooth

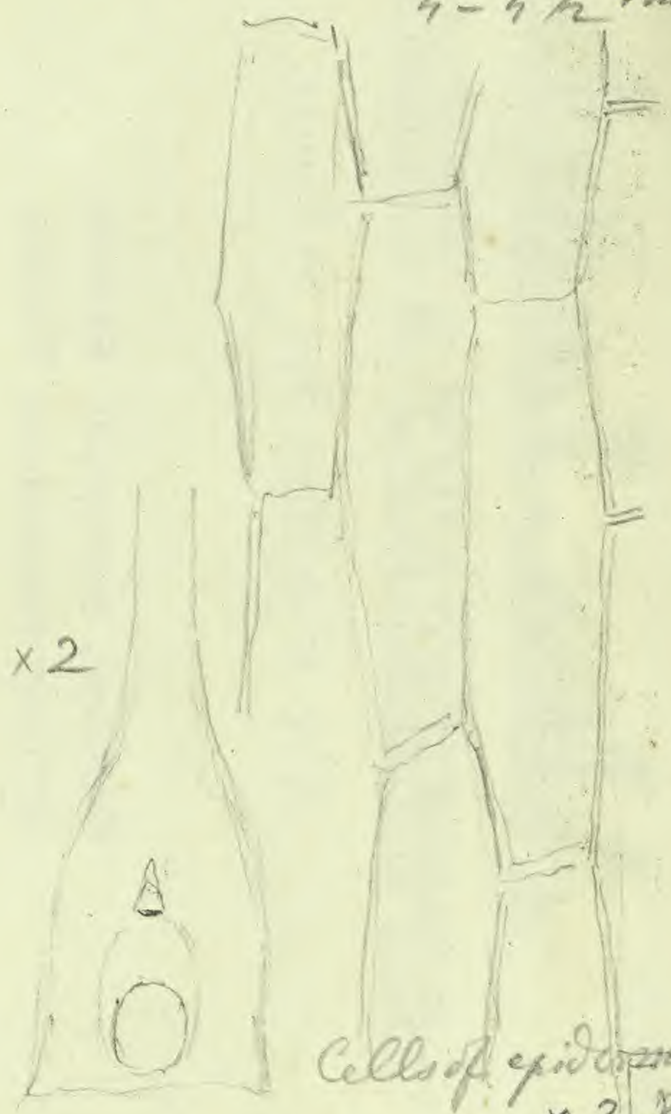


$\frac{53-48.5}{60}$ = 0.72 – 0.81 mm diam

ridges, shaggy, sometimes sparsely on lower surface, anastomosing, transverse almost



Cells of sporangium
x 280
no brown cells seen



x 2

Cells of epidermis
x 280
no stomata

13613

Alex. Leitch,

APOTHECARY & CHEMIST,

Cor. 4th & Olive Sts., St. Louis.

MISSOURI BOTANICAL GARDEN
GEORGE ENGELMANN PAPERS

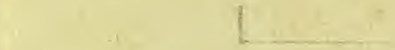
cm 0 1 2 3 4 5 6 7 8 9 10
copyright reserved
MISSOURI BOTANICAL GARDEN

5093 Bolander 1866

Jan 25 1874

Isoetes

Diam of macrospores near Monotrail, 10000' alt.



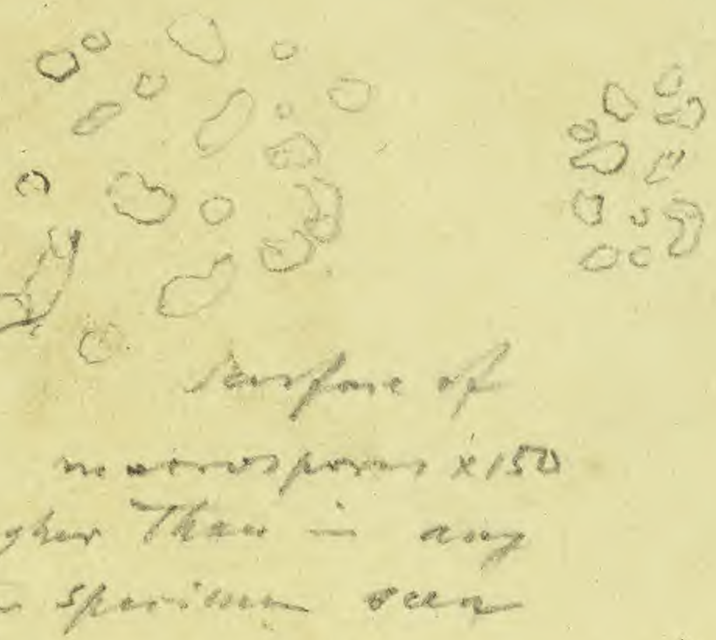
23.5 – 29 / 60 mm

= 0.39 – 0.48 mm

microspore. brown, spindle

11 – 12 / 4.15 = 0.026 – 0.029 mm

Stomata seen



Surface of macrospore x150 rougher than in any other species seen

0 1 2 3 4 5 6 7 8 9 10
cm
copyright reserved
MISSOURI BOTANICAL GARDEN

13614

STODDARD PHARMACY,

N. W. Corner Easton and Garrison Ave's.

POOLE & CO.

MISSOURI BOTANICAL GARDEN
GEORGE ENGELMANN PAPERS

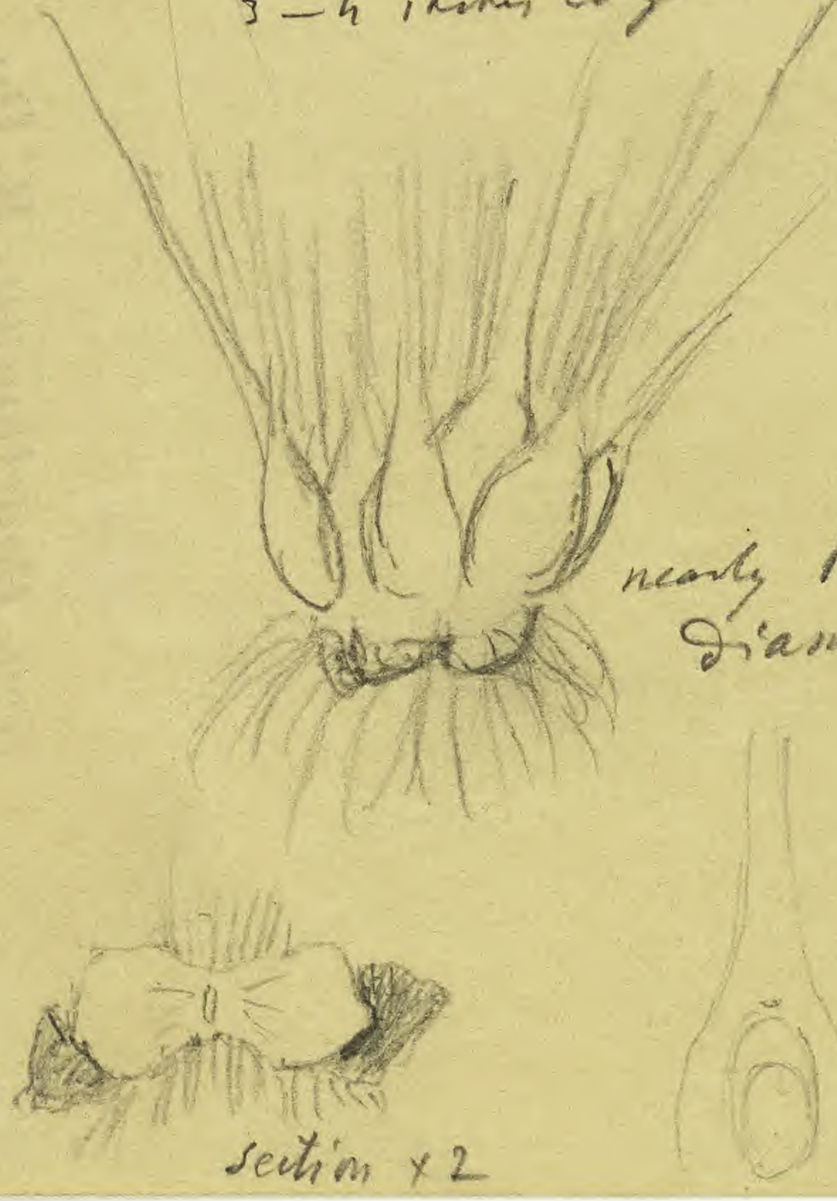
cm 0 1 2 3 4 5 6 7 8 9 10
Copyright reserved
MISSOURI BOTANICAL GARDEN

Isoëtes Bolanderi Engelm

March 28 1881

Ice Lake, Sierra Nevada near Soda Springs Station
G.E Oct 11 1880

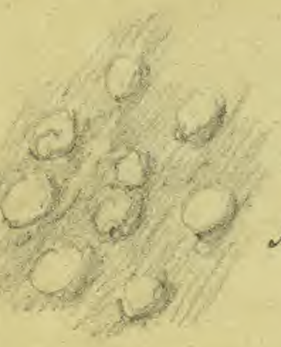
15–25 leaves
3–4 inches long



nearly 1 inch diameter

×2

section ×2

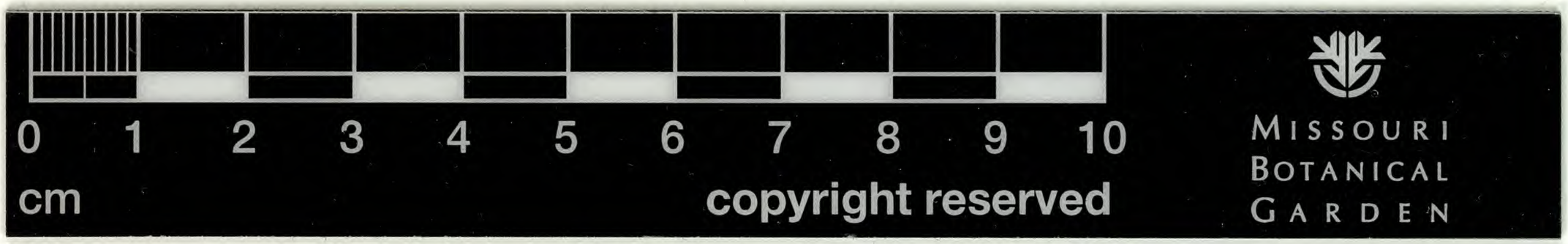


×150 surface lightly and minutely tuberculated or almost smooth

$\frac{20\frac{1}{2}-24}{60}$ = 0.34 – 0.40 mostly 0.37 mm diam macrospores

$\frac{10-12}{415}$ = 0.024 – 0.028 mm long, very thick smooth

fig.



13615

Henry T. Rohlfing,

APOTHECARY,

No. 2600 Laclede Ave., S. W. Cor. Jefferson Ave.,

ST. LOUIS, MO.

No. ..... *Date,* *187*

℞

MISSOURI BOTANICAL GARDEN
GEORGE ENGELMANN PAPERS

Geo. Engelmann, M. D.,
No. 3003 Locust Street.

cm 0 1 2 3 4 5 6 7 8 9 10
Copyright reserved
MISSOURI BOTANICAL GARDEN

Nov 5 1881

Isoetes Bolanderi

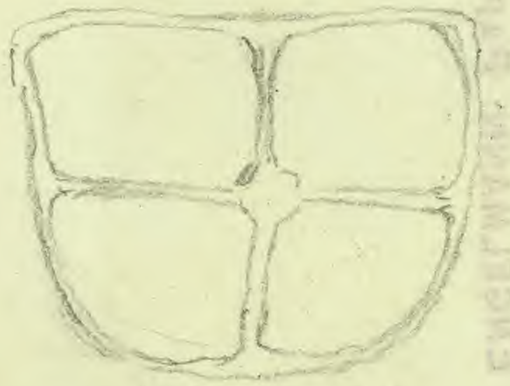
W. H Sakkisdorf

microspore x 415

$\frac{11-12}{415} = .027-.029$ mm

$\frac{19-22}{60} = 0.32-0.37$

x20



Sporangia 1-9 walls Thin

no veretenchymatic cells in sporangia.

x60

x150

x2

macrospore strongly papillose tuberculated

Stomate !
no Basal bundles

0 1 2 3 4 5 6 7 8 9 10
cm
copyright reserved
MISSOURI BOTANICAL GARDEN

13616

ALEX. LEITCH,

APOTHECARY & PHARMACEUTIST,

Marble Building Cor. Fourth & Olive Sts. St. Louis, Mo.

MISSOURI BOTANICAL GARDEN
GEORGE ENGELMANN PAPERS

cm 0 1 2 3 4 5 6 7 8 9 10
copyright reserved
MISSOURI BOTANICAL GARDEN